Report On

FCC Testing of the Sharp Quad-band LTE (B1/ B3/ B17/ B26), Dual-band WCDMA (FDD I / V) , Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC,FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00235

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REPORT ON

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DATED 16 May 2016

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Toubella T Guy

UKAS TESTING 0141

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Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp Quad-band LTE (B1/ B3/ B17/ B26), Dual-band WCDMA (FDD I / V) , Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC,FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)

1.1 INTRODUCTION

The information contained in this report is intended to show the verification of FCC Testing of the Sharp Quad-band LTE (B1/ B3/ B17/ B26), Dual-band WCDMA (FDD I / V) , Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC,FeliCa) and GPS to the requirements of FCC 47 CFR Part 15C.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Sharp Corporation
Serial Number(s)	IMEI 004401115744365
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C (2015)
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	10792 16 March 2016
Start of Test	25 April 2016
Finish of Test	30 April 2016
Name of Engineer(s)	M Toubella T Guy
Related Document(s)	ANSI C63.10: 2013

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
FeliCa				
2.1	15.225 and 15.215 (c)	20 dB Bandwidth	Pass	
2.2	15.225 (a)(b)(c)(d)	Field Strength of any Emission	Pass	
2.3	15.225 (e)	Frequency Tolerance Under Temperature Variations	Pass	

1.3 PRODUCT TECHNICAL DESCRIPTION

Refer to Model Description APYHRO00235 Rev 4.0 document.

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp Quad-band LTE (B1/ B3/ B17/ B26), Dual-band WCDMA (FDD I / V) , Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC,FeliCa) and GPS. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 4.0 V DC supply from the integral battery.

FCC Measurement Facility Registration Number
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Sharp Quad-band LTE (B1/ B3/ B17/ B26), Dual-band WCDMA (FDD I / V) , Quad-band GSM (850/900/1800/1900) & WiMAX2+ (TDD41) multi mode Smart phone with Bluetooth, WLAN, SRD(NFC,FeliCa) and GPS
In accordance with FCC 47 CFR Part 15C (FeliCa)

2.1 20 DB BANDWIDTH

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.225 and 15.215 (c)

2.1.2 Equipment Under Test and Modification State

S/N: IMEI 004401115744365 - Modification State 0

2.1.3 Date of Test

28 April 2016

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clause 6.9.1.

2.1.6 Environmental Conditions

Ambient Temperature	23.8 - 24.0°C
Relative Humidity	20.4 - 20.5%

Product Service

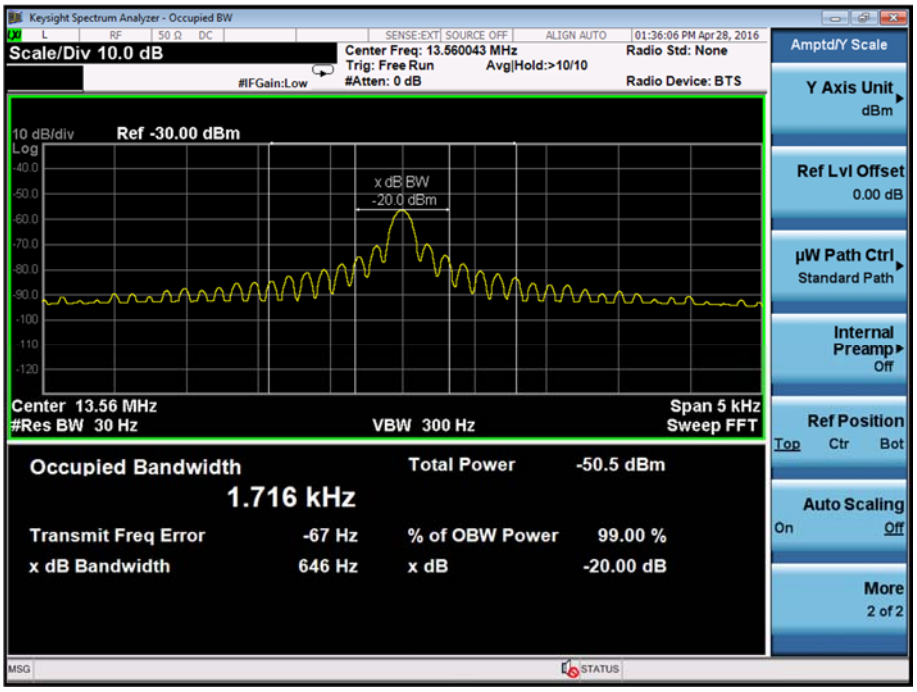
2.1.7 Test Results

4.0 V DC Supply (Integral Battery)

FeliCa, 20 dB Bandwidth Result

Frequency (MHz)	20 dB Bandwidth (Hz)
13.56	646

FeliCa, 20 dB Bandwidth Plot



FCC 47 CFR Part 15, Limit Clause 15.215 (c)

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

2.2 FIELD STRENGTH OF ANY EMISSION

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.225 (a)(b)(c)(d)

2.2.2 Equipment Under Test and Modification State

S/N: IMEI 004401115744365 - Modification State 0

2.2.3 Date of Test

29 April 2016 & 30 April 2016

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clause 6.3, 6.4 and 6.5.

Remarks

Modulation Type A [106 kbps] was proven to be the worst case modulation scheme available as determined by carrier power measurements. The orientation that produced the highest Transmitter power was with the EUT in an upright position.

2.2.6 Environmental Conditions

Ambient Temperature	18.3 - 19.9°C
Relative Humidity	29.0 - 34.2%

Product Service

2.2.7 Test Results

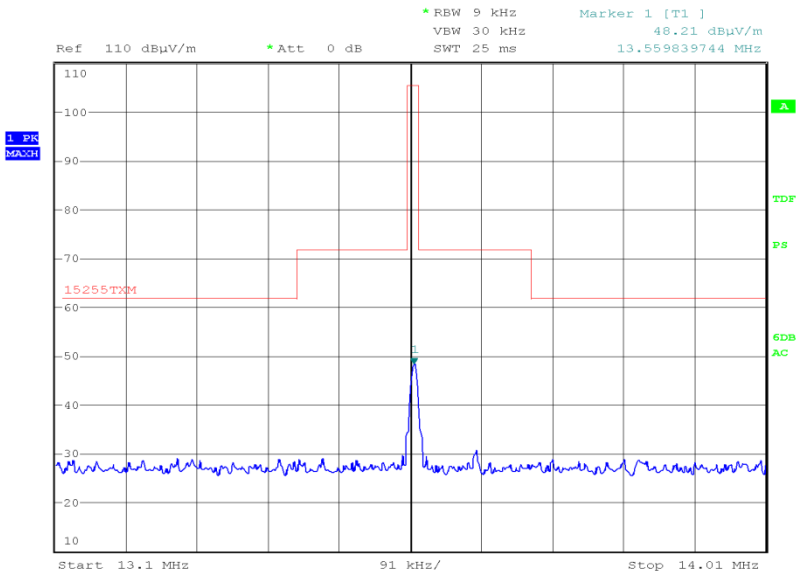
4.0 V DC Supply (Integral Battery)

FeliCa, Carrier Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m) at 3m	Quasi-Peak Level (dBµV/m) at 30m*	Quasi-Peak Level (µV/m) at 3m	Quasi-Peak Level (µV/m) at 30m *	Angle (°)	Height (m)	Polarisation
13.56	43.65	22.26	152.23	12.97	171	1.0	Face On

*The level at 30m was calculated using the dBµV/m measurement at 3m and extrapolating this result to produce a level at 30m as per ANSI C63.10, clause 6.4.4.2. This value was then converted to obtain the value in µV/m.

FeliCa, Carrier Plot

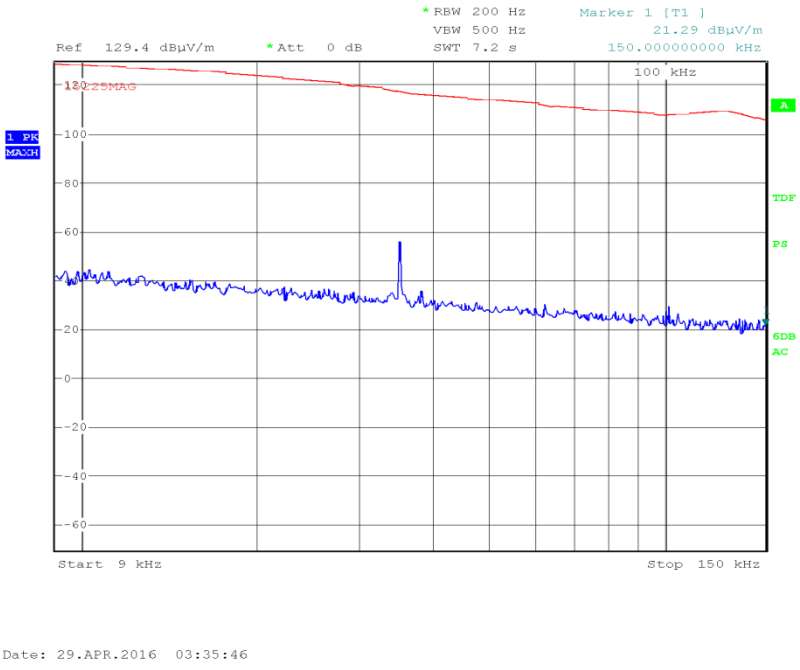


FeliCa, 9 kHz to 30 MHz, Field Strength of any Emission Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m) at 3m	Quasi-Peak Level (dBµV/m) at 30m	Quasi-Peak Level (µV/m) at 3m	Quasi-Peak Level (µV/m) at 30m	Angle (°)	Height (m)	Polarisation
*							

*No emissions were detected within 10 dB of the limit.

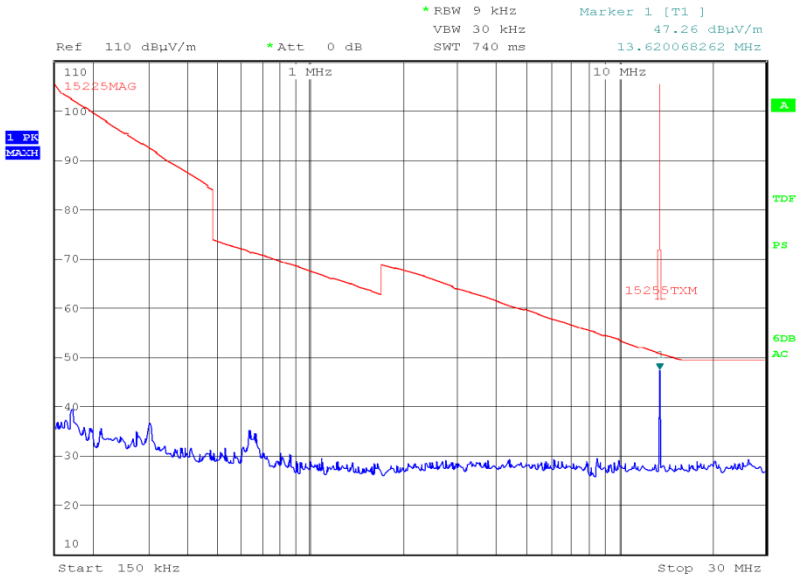
FeliCa, 9 kHz to 150 kHz, Field Strength of any Emission Plot



Date: 29.APR.2016 03:35:46

Product Service

FeliCa, 150 kHz to 30 MHz, Field Strength of any Emission Plot

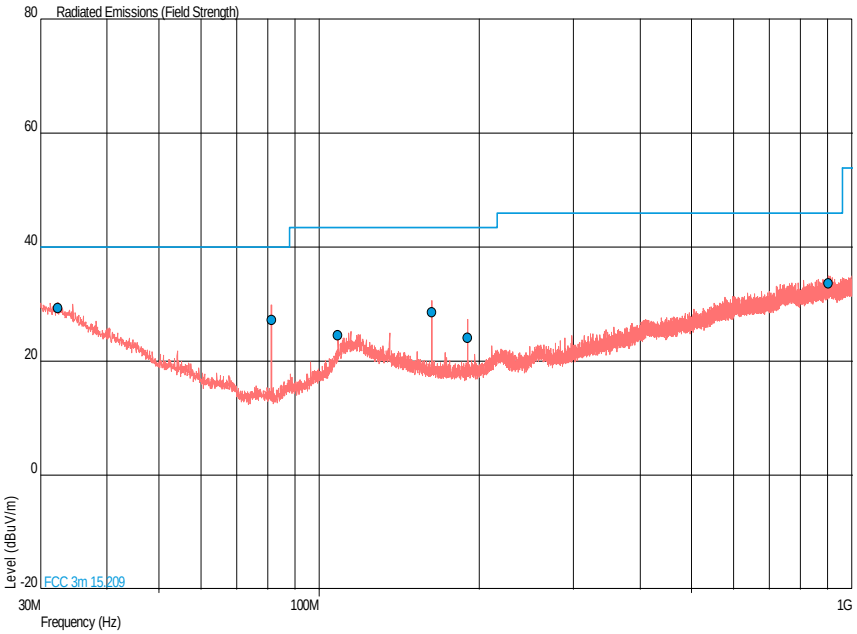


Date: 29.APR.2016 03:30:20

FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Results

Frequency (MHz)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Level (µV/m)	Quasi-Peak Margin (dµV/m)	Quasi-Peak Margin (µV/m)	Angle (°)	Height (m)	Polarisation
32.334	29.4	29.5	-10.6	-70.5	30	1.00	Vertical
81.356	27.3	23.2	-12.7	-76.8	109	1.00	Vertical
108.487	24.6	17.0	-18.9	-133.0	143	1.00	Vertical
162.722	28.6	26.9	-14.9	-123.1	66	1.00	Horizontal
189.814	24.1	16.0	-19.4	-134.0	53	2.07	Horizontal
901.274	33.6	47.9	-12.4	-152.1	360	4.00	Vertical

FeliCa, 30 MHz to 1 GHz, Field Strength of any Emission Plot



FCC 47 CFR Part 15, Limit Clause 15.225 (a)(b)(c)(d)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 to 0.490	2400/F (kHz)	300
0.490 to 1.705	24000/F (kHz)	30
1705 to 30	30	30
30 to 88	100**	3
88 to 216	150**	3
216 to 960	200**	3
Above 960	500	5

2.3 FREQUENCY TOLERANCE UNDER TEMPERATURE VARIATIONS

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.225 (e)

2.3.2 Equipment Under Test and Modification State

S/N: IMEI 004401115744365 - Modification State 0

2.3.3 Date of Test

25 April 2016

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The test was performed in accordance with ANSI C63.10, clause 6.8.

2.3.6 Environmental Conditions

Ambient Temperature	21.1 - 21.2°C
Relative Humidity	25.6 - 36.6%

Product Service

2.3.7 Test Results

FeliCa, Felica, Frequenecy Tolerance Under Temperature Variations Results

Temperature Interval	Voltage	Fundamental Frequency (MHz)	Fundamental Frequency Deviation (%)
-20 °C	4.0 V DC	13.56	0.00112
-10 °C	4.0 V DC	13.56	0.00130
0 °C	4.0 V DC	13.56	0.00094
+10 °C	4.0 V DC	13.56	0.00094
+20 °C	4.0 V DC	13.56	0.00040
+20 °C	4.0 V DC	13.56	0.00040
+30 °C	4.0 V DC	13.56	0.00013
+40 °C	4.0 V DC	13.56	0.00011
+50 °C	4.0 V DC	13.56	0.00007

FCC 47 CFR Part 15, Limit Clause 15.225 (e)

The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency.

Product Service

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 - 20 dB Bandwidth					
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Power Supply	Iso-tech	IPS 2010	2439	-	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	19-Aug-2016
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	2-Sep-2016
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	7-Sep-2016
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	8-Oct-2016
Section 2.2 - Field Strength of any Emissions					
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	11-Jun-2017
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	2-Nov-2016
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.3 - Frequency Tolerance Under Temperature Variations					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	18-Jun-2016
RF Coupler	TUV SUD Product Service	RFC1	414	-	TU
Hygrometer	Rotronic	I-1000	2882	12	4-Nov-2016
Thermocouple Thermometer	Fluke	51	3174	12	9-Dec-2016
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	29-Jan-2017
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4519	12	16-Feb-2017
EMI Receiver	Keysight Technologies	N9038A MXE	4629	12	3-Sep-2016

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Field Strength of any Emission	9 kHz to 1 GHz: ± 5.1 dB
20 dB Bandwidth	± 16.74 kHz
Frequency Tolerance Under Temperature Variations	± 3.54 Hz

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).